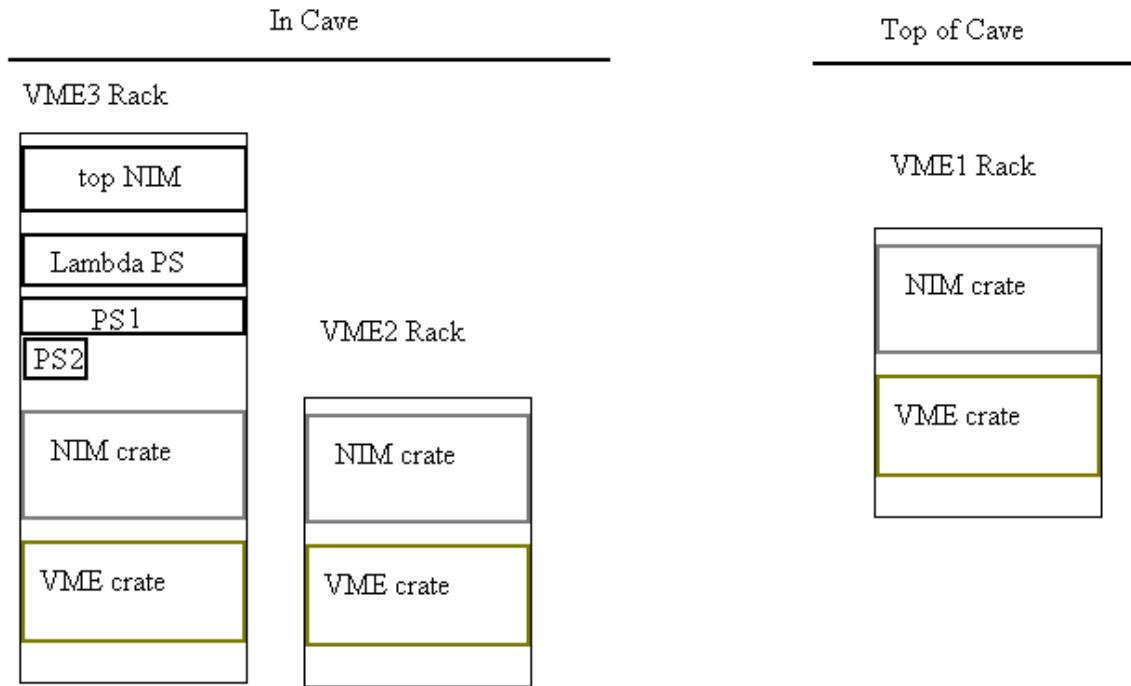


NPDGamma DAQ cabling guide
Mike Mason and Greg Mitchell
June 2005



In this document the cables are labeled according to the following convention:

Cables: pathname of port for start of wire --> path name of port for end of wire

Pathname labeling: RackName.CrateName.Module#.ModuleSection.ModuleSpecific

The rack names are VME3, VME2, and VME1.

A typical entry in this document is something like

VME3.NIM.1.2.out.3 _ VME3.VME.4.scanclk

where the first part means: the VME3 rack, the NIM crate (the lower one), the first module from the left, the second part from the top, the output side, and the third connector down; and the second part means: the VME3 rack, the VME crate, the fourth module from the left, the scanclk connector.

The VME3 Rack is located in the cave closest to the door. As shown in the figure above, it holds two NIM crates, one VME crate and a number of power supplies.

VME3 RACK

Top NIM crate:

1	2	3	4-10 empty	11	12
---	---	---	---------------	----	----

First 3 modules used for high voltage supplies for beam monitors

Module 1: Tennelec TC950 SKV Bias Supply

Module 2: Tennelec TC950 SKV Bias Supply

Module 3: Tennelec TC950A SKV Bias Supply

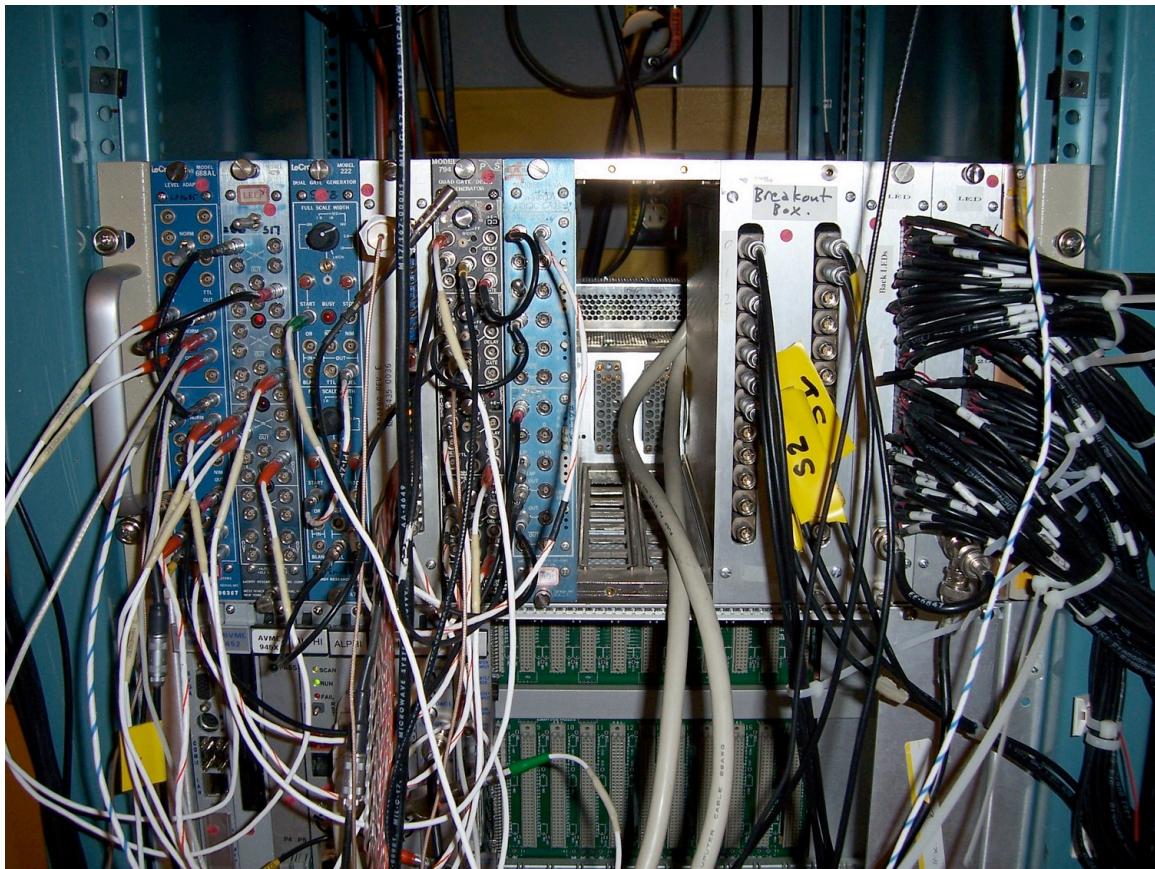
Module 11: Fiber optic Link Receiver DAQ T₀

Module 12: Fiber optic Link Receiver RFSF T₀

Lambda PS: power supply for monitor preamps

PS1: Gray HV supply not used.

PS2: Agilent E3610A, LED power supply



NIM crate: **VME3.NIM**

1	2	3	4	5	6	7-8 empty	9	10	11	12
---	---	---	---	---	---	--------------	---	----	----	----

NIM Module 1: LeCroy model 688AL, level adapter

VME3.NIM.1

The Norm/Complement switches are set top to bottom compl/norm/compl/norm

VME3.NIM.1.1 is NIM to TTL COMPL (no cables)

VME3.NIM.1.2 is NIM to TTL NORM

Cables:

VME3.NIM.1.2.in.1	_ VME3.NIM.1.3.out.2
VME3.NIM.1.2.out.1	_ spin flipper
VME3.NIM.1.2.in.2	_ VME3.NIM.2.1.out
VME3.NIM.1.2.out.2	_ VME3.VME.8.gate/trig
VME3.NIM.1.2.in.3	_ VME3.NIM.2.2.out
VME3.NIM.1.2.out.3	_ VME3.VME.4.scanclk

VME3.NIM.1.3 is TTL to NIM COMPL

Cables:

VME3.NIM.1.3.in.1	_ DAQ T ₀ fiber optic receiver
VME3.NIM.1.3.out.1	_ VME3.NIM.2.1.in
VME3.NIM.1.3.in.2	_ VME3.NIM.4.lemoOut2
VME3.NIM.1.3.out.2	_ VME3.NIM.1.1.2.in.1

VME3.NIM.1.4 is TTL to NIM NORM

Cables:

VME3.NIM.1.4.in.1	_ VME3.VME.3.P4.pins8
VME3.NIM.1.4.out.1	_ VME3.NIM.6.2.inputA
VME3.NIM.1.4.in.2	_ nothing
VME3.NIM.1.4.out.2	_ nothing
VME3.NIM.1.4.in.3	_ VME3.VME.8.clockout (T connector w/50Ω terminator)
VME3.NIM.1.4.out.3	_ VME3.NIM.5.3.trigger
VME3.NIM.1.4.in.4	_ VME3.VME.3.P4.pins2
VME3.NIM.1.4.out.4	_ VME3.NIM.5.4.trigger

NIM Module 2: LeCroy model 429 logic fan in fan out

Set in 2x8 mode. Section 1 is a DAQ T₀ fan out includes 10 millisecond delay, if implemented upstairs. Section 2 combination of trigger sources for ALPHI ADC's, the two sources are Joerger VS 16 *2500 pulses at 62.5 KHz i.e. normal data taking). The other source is arming pulse from Acromag at setup/beginning of run.

VME3.NIM.2

VME3.NIM.2.1

Cables: VME3.NIM.2.1.in _ VME3.NIM.1.3.out.1
 VME3.NIM.2.1.out1 _ VME3.NIM.1.2.in.2
 VME3.NIM.2.1.out2 _ VME3.NIM.5.1.trigger

VME3.NIM.2.2

Cables: VME3.NIM.2.2.in1 _ VME3.NIM.5.3.gate
 VME3.NIM.2.2.in2 _ VME3.NIM.5.4.gate
 VME3.NIM.2.2.out _ VME3.NIM.1.2.in.3

NIM Module 3: LeCroy model 222 dual gate generator

Produces the delay for spin state reversal.

VME3.NIM.3

VME3.NIM.3.1 Switch set to about 100 milliseconds

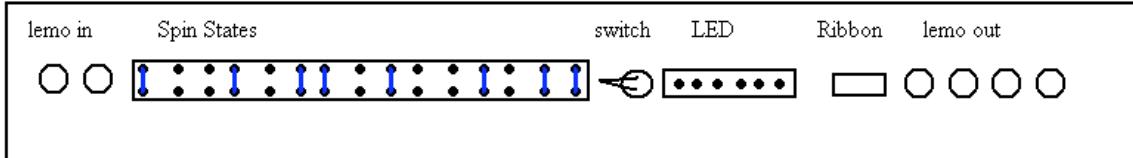
Cables: VME3.NIM.3.1.start _ VME3.VME.7.triggerIn (T connector)
 VME3.NIM.3.1.delOut _ VME3.NIM.3.2.start

VME3.NIM.3.2 Switch set to about 10 microseconds

Cables: VME3.NIM.3.2.start _ VME3.NIM.3.1.delOut
 VME3.NIM.3.2.nimOut _ VME3.NIM.6.1.inputB
 VME3.NIM.3.2.TTLOut _ VME3.4.lemoInput2 (T connector 50Ω terminator)

NIM Module 4: Spin state generator 670490 RevE MFR65435 0036

VME3.NIM.4



VME3.NIM.4

Calbes:
VME3.NIM.4.lemoInput1 _ VME3.VME.3.P4.pins12
VME3.NIM.4.lemoInput2 _ VME.NIM.3.2.TTLOut
Orange on top VME3.NIM.4.ribbonCable(4) _ VME3.VME.3.P4.pins14-17 black on top
VME3.NIM.4.lemoOut1 _ spin flipper dummy load
VME3.NIM.4.lemoOut2 _ VME3.NIM.1.3.in.2
VME3.NIM.4.lemoOut3 _ nothing
VME3.NIM.4.lemoOut4 _ nothing

NIM Module 5: Phillips Scientific 794 quad gate generator

VME3.NIM.5

VME3.NIM.5.1 data valid bit

Cables:
VME3.NIM.5.1.trigger _ VME3.NIM.2.1.out2
VME3.NIM.5.1.reset _ VME3.NIM.6.2.out1
VME3.NIM.5.1.TTL _ VME3.VME.3.P4.pins4
VME3.NIM.5.1.gate _ VME3.NIM.6.1.inputA

VME3.NIM.5.2 data stale bit

Cables:
VME3.NIM.5.2.trigger _ VME3.NIM.6.1.out
VME3.NIM.5.2.reset _ VME3.NIM.6.2.out2
VME3.NIM.5.2.TTL _ VME3.VME.3.P4.pins6

VME3.NIM.5.3 conditioning for normal ADC triggers

Cables:
VME3.NIM.5.3.trigger _ VME3.NIM.1.4.out.3
VME3.NIM.5.3.gate _ VME3.NIM.2.2.in1

VME3.NIM.5.4 conditioning for arming pulse ADC trigger

Cables:
VME3.NIM.5.4.trigger _ VME3.NIM.1.4.out.4
VME3.NIM.5.4.gate _ VME3.NIM.2.2.in2

NIM Module 6: LeCroy model 364AL 4-fold logic gate

VME3.NIM.6

VME3.NIM.6.1 logic for data stale, set to 2-fold coincidence A and B

Cables: VME3.NIM.6.1.**inputA** _ VME3.NIM.5.1.gate
 VME3.NIM.6.1.**inputB** _ VME3.NIM.3.2.nimOut
 VME3.NIM.6.1.**out** _ VME3.NIM.5.2.trigger

VME3.NIM.6.2 used as fan out for resets for data valid and data stale bits, set to 1-fold coincidence A

Cables: VME3.NIM.6.2.**inputA** _ VME3.NIM.4.output1
 VME3.NIM.6.2.**out1** _ VME3.NIM.5.1.reset
 VME3.NIM.6.2.**out2** _ VME3.NIM.5.2.reset

NIM Module 9: Breakout Box (two slots wide)

VME3.NIM.9

VME3.NIM.9.1

Cables: VME3.NIM.9.1.0 _ detector sums
 VME3.NIM.9.1.1 _ detector sums
 VME3.NIM.9.1.2 _ detector sums
 VME3.NIM.9.1.3 _ detector sums
 VME3.NIM.9.1.4 _ m1
 VME3.NIM.9.1.5 _ m2
 VME3.NIM.9.1.6 _ m3

VME3.NIM.9.2

Cables: VME3.NIM.9.2.0 _ spin flipper voltage
 VME3.NIM.9.2.1 _ spin flipper current

NIM Module 11/12: Last two NIM Modules LED power supplies

VME crate: **VME3.VME**

1	2	3	4	5	6	7	8	empty
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VME Module 1: VMI VME 7698 single board computer with fiber link to hazel

VME Module 2: VMI VME 7452 floppy and hard disk for single board computer

VME Module 3: Acromag digital IO module

VME3.VME.3

VME3.VME.3.P4 ground on left

Cables: VME3.VME.3.P4.pins2 _ VME3.NIM.1.4.in.4
 VME3.VME.3.P4.pins4 _ VME3.NIM.5.1.TTL
 VME3.VME.3.P4.pins6 _ VME3.NIM.5.2.TTL
 VME3.VME.3.P4.pins8 _ VME3.NIM.1.4.in.1
 VME3.VME.3.P4.pins12 _ VME3.NIM.4.lemoInput1
Black on top VME3.VME.3.P4.pins14-17 _ VME3.NIM.4.ribbonCable(4) Orange on top

VME Module 4: ALPHI ADM 31 controller

Dip switches 1, 2, 4 to the right

Dip switch 8 to the left

VME3.VME.4

Cables: VME3.VME.4.scanclk _ VME3.NIM.1.2.out.3

VME Modules 5/6: SCSI cables to back of NIM crate Breakout Box

VME Module 7: Joerger VWG

VME3.VME.7

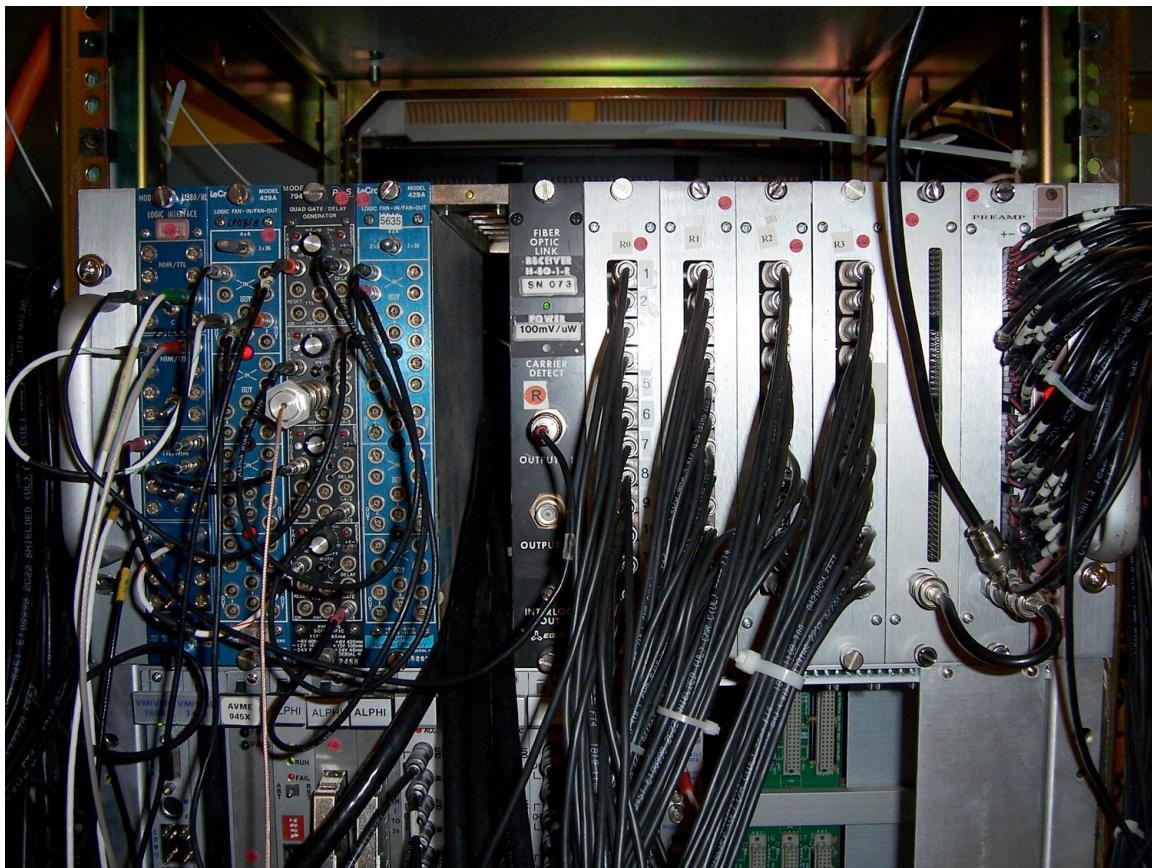
Cables: VME3.VME.7.outBNC _ spin flipper
 VME3.VME.7.triggerIn (T connector) _ RFSF T₀ to fiber optic receiver

VME Module 8: Joerger VS 16

VME3.VME.8

Cables: VME3.VME.8.gate/trig _ VME3.NIM.1.2.out.2
 VME3.VME.8.clockout (T connector w/50Ω terminator) _ VME3.NIM.1.4.in.3

The VME2 Rack is located in the cave. It holds one NIM crate and one VME crate.



NIM crate: **VME2.NIM**

1	2	3	4	5 empty	6	7-10		11	12
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NIM Module 1: ORTec LI38/NL level converter

VME2.NIM.1

VME2.NIM.1.1 is NIM to TTL NORM

Cables: VME2.NIM.1.1.**in.3** _ VME2.NIM.4.1.out
 VME2.NIM.1.1.**out.3** _ VME2.VME.4.scanclk

VME2.NIM.1.2 is NIM to TTL COMPL

Cables: VME2.NIM.1.2.**in.1** _ VME2.NIM.2.1.out
 VME2.NIM.1.2.**out.1** _ VME2.VME.14.gate/trigger

VME2.NIM.1.3 is TTL to NIM NORM

Cables: VME2.NIM.1.3.**in.1** _ VME2.NIM.6.out1
 VME2.NIM.1.3.**out.1** _ VME2.NIM.2.1.in
 VME2.NIM.1.3.**in.2** _ VME2.VME.14.clockout (T connector 50 ohm term)
 VME2.NIM.1.3.**out.2** _ VME2.NIM.3.4.trigger

VME2.NIM.1.4 is NIM to TTL COMPL

Cables: VME2.NIM.1.4.**in.1** _ VME2.VME.3.p4.pins2
 VME2.NIM.1.4.**out.1** _ VME2.NIM.3.4.trigger

NIM Module 2: LeCroy 429A logic fan in fan out in 2x8 mode

VME2.NIM.2: only top part used. Fans out DAQ T₀

VME2.NIM.2.1 is NIM to TTL NORM

Cables: VME2.NIM.2.1.**in** _ VME2.NIM.1.3.out.1
 VME2.NIM.2.1.**out1** _ VME2.NIM.1.2.in.1
 VME2.NIM.2.1.**out2** _ VME2.NIM.3.1.trigger

NIM Module 3: Quad gate/delay generator

VME2.NIM.3: top 2 parts are cabled but unused.

VME2.NIM.3.1

Cables: VME2.NIM.3.1.**trigger** _ VME2.NIM.2.1.out
 VME2.NIM.3.1.**del** _ VME2.NIM.3.2.trigger

VME2.NIM.3.2

Cables: VME2.NIM.3.2.**trigger** _ VME2.NIM.3.1.del
 VME2.NIM.3.2.**TTL** _ VME2.VME.3.p4pins4

VME2.NIM.3.3 signal conditioning for signal pulses of the ALPHI ADC's

Cables: VME2.NIM.3.3.**trigger** _ VME2.NIM.1.3.out.2
 VME2.NIM.3.3.**gate** _ VME2.NIM.4.in1

VME2.NIM.3.4 signal conditioning for signal pulses of the ALPHI ADC's

Cables: VME2.NIM.3.4.**trigger** _ VME2.NIM.1.4.out.1
 VME2.NIM.3.4.**gate** _ VME2.NIM.4.in2

NIM Module 4: LeCroy 429A logic fan in fan out in 4x4 mode

VME2.NIM.4: only the top part is used

VME2.NIM.4.1

Cables: VME2.NIM.4.**in1** _ VME2.NIM.3.3.gate
 VME2.NIM.4.**in2** _ VME2.NIM.3.4.gate
 VME2.NIM.4.**out** _ VME2.NIM.1.1.in.3

NIM Module 6: DAQ T₀ for VME2 Rack.

VME2.NIM.6:

Cables: VME2.NIM.6.**output1** _ VME2.NIM.1.3.input.1

NIM Module 7-10: Sum and difference amplifiers--inputs on front sum and difference on back. The sum outputs go to VME3 Rack NIM crate Breakout Box channels 0,1,2,3 difference signals SCSI cables to ALPHI ADC's in VME2 rack VME crate.

NIM Module 11-12: Detector Preamp power supplies. 5V, typically draws ~5A

VME crate: **VME2.VME**

1	2	3	4	5	6	7-12	13	empty
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VME Module 1: VMI VME 7698

VME2.VME.1: single board computer, fiber optic Ethernet to hazel

VME Module 2: VMI VME 7452

VME2.VME.2: floppy and hard disk module for single board computer

VME Module 3: Acromag 9450I

VME2.VME.3: digital I/O

Cables: VME2.VME.3.**p4pins2** _ VME2.NIM.1.4.input.1
 VME2.VME.3.**p4pins4** _ VME2.NIM.3.2.TTL (ground on left)

VME Module 4: ALPHI ADM 31 ADC controller

VME2.VME.4: Dip switches 1,2,4 set right. Dip switch 8 set left

Cables: VME2.VME.4.**scanclk** _ VME2.NIM.1.1.out.3

VME Module 5-6: ALPHI ADC units AD-24D. each module has 24 different channels.

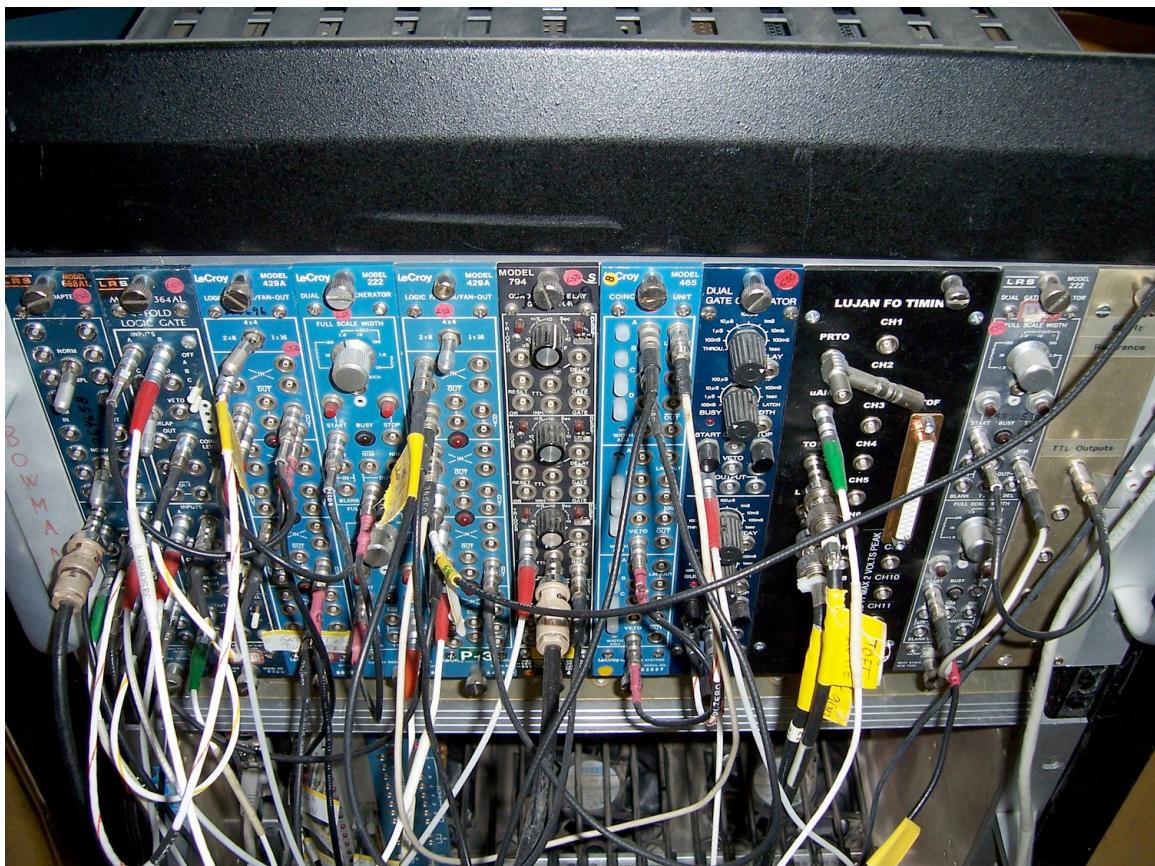
VME Module 7-13: TRIUMF modules. Inputs are raw detector signals. Outputs go to front of sum and difference amplifiers.

VME Module 14: Joerger VS 16

VME2.VME.14:

Cables: VME2.VME.14.**gate/trigger** _ VME2.NIM.1.2.out.1
 VME2.VME.14.**clockout** _ VME2.NIM.1.3.in.2 (T connector 50 ohm term)

The VME1 Rack is located on top of the cave. It holds the one NIM crates and one VME crate. On top of the rack is a SRS DG535 set to 10 ms.



NIM crate: **VME1.NIM**

1	2	3	4	5	6	7	8	9/10	11	12
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NIM Module 1: LeCroy 688AL level converter

VME1.NIM.1: sections 1 and 2 not used

VME1.NIM.1.3 is TTL to NIM COMPL

Cables:

- VME1.NIM.1.3.in.1 _ SRS.output.A
- VME1.NIM.1.3.out.1 _ VME1.NIM.3.1.in (labeled delay T_0)
- VME1.NIM.1.3.in.2 _ either VME1.NIM.9/10.PRT₀ (real T_0)
Or VME1.NIM.11.2.TTLout (fake T_0)
- VME1.NIM.1.3.out.2 _ VME1.NIM.6.3.trigger
- VME1.NIM.1.3.in.4 _ VME1.NIM.9/10.uAMP
- VME1.NIM.1.3.out.4 _ VME1.NIM.2.2.inputB

VME1.NIM.1.4 is TTL to NIM NORM

Cables:

- VME1.NIM.1.4.in.1 _ VME1.VME.4.p4pins14
- VME1.NIM.1.4.out.1 _ VME1.NIM.5.3.in
- VME1.NIM.1.4.in.2 _ VME1.VME.4.p4pins2
- VME1.NIM.1.4.out.2 _ VME1.VME.3.armin

NIM Module 2: LeCroy 364AL 4 fold logic gate.

VME1.NIM.2: Top coincidence provides gated T_0 's i.e. coincidence between the delayed T_0 and the Run enable from the Acromag VME module. Bottom coincidence between gate and V to F proton current signal output counted by scaler in VME crate as measure of proton current.

VME1.NIM.2.1 set 2 fold coincidence A and B

Cables:

- VME1.NIM.2.1.inputA _ VME1.NIM.3.1.out
- VME1.NIM.2.1.inputB _ VME1.NIM.5.3.out
- VME1.NIM.2.1.out _ VME1.NIM.3.2.in

VME1.NIM.2.2 set 2 fold coincidence A and B

Cables:

- VME1.NIM.2.2.inputA _ VME1.NIM.8.2.out
- VME1.NIM.2.2.inputB _ VME1.NIM.1.3.out.4
- VME1.NIM.2.2.out _ VME1.VME.3.ch3

NIM Module 3: LeCroy 429A logic fan in fan out in 2x8 mode

VME1.NIM.3:

VME1.NIM.3.1 delay T₀ fan out

Cables: VME1.NIM.3.1.**in** _ VME1.NIM.1.3.out.1
 VME1.NIM.3.1.**out1** _ VME1.NIM.4.1.start
 VME1.NIM.3.1.**out2** _ VME1.NIM.2.1.inputA
 VME1.NIM.3.1.**out3** _ VME1.NIM.8.start/in
 VME1.NIM.3.1.**out4** _ VME1.VME.3.ch1

VME1.NIM.3.2 gated delay T₀ fan out

Cables: VME1.NIM.3.2.**in** _ VME1.NIM.2.1.out
 VME1.NIM.3.2.**out1** _ VME1.VME.3.ch2
 VME1.NIM.3.2.**out2** _ top of hazel/fiver rack for conversion to fiber optic
signal gated T₀'s sent to VME 2/3 Rack

NIM Module 4: LeCroy 222 dual gate/delay generator 1./2. was used for VME LeCroy CI ADC gate but no longer used.

NIM Module 5: LeCroy 429A logic fan in fan out in 4x4 mode

VME1.NIM.5:

VME1.NIM.5.1

Cables: VME1.NIM.5.1.**in** (labeled prompt T₀) _ VME1.NIM.6.3.gate
 VME1.NIM.5.1.**out** _ VME1.NIM.7.1.inputA

VME1.NIM.5.2

Cables: VME1.NIM.5.2.**in** _ VME1.NIM.7.1.Linout
 VME1.NIM.5.2.**out** _ top of hazel/fiver rack for conversion to fiber optic
for spin flipper

VME1.NIM.5.3 run enable fan out (signal from Acromag)

Cables: VME1.NIM.5.3.**in** _ VME1.NIM.1.4.out1
 VME1.NIM.5.3.**out1** _ VME1.NIM.2.1.inputB
 VME1.NIM.5.3.**out2** _ VME1.NIM.7.1.inputB

NIM Module 6: Phillips quad gate delay generator

VME1.NIM.6:

VME1.NIM.6.3

Cables: VME1.NIM.6.3.**trigger** _ VME1.NIM.1.3.out2
 VME1.NIM.6.3.**TTL** _ SRS trigger
 VME1.NIM.6.3.**gate** (prompt T_0) _ VME1.NIM.5.1.in

NIM Module 7: LeCroy 465 coincidence unit

VME1.NIM.7: used to send gated undelayed (prompt) T_0 's to spin flipper i.e. Joerger VWG in VME3 crate

VME1.NIM.7.1

Cables: VME1.NIM.7.1.**inputA** _ VME1.NIM.5.1.out
 VME1.NIM.7.1.**inputB** _ VME1.NIM.5.3.out
 VME1.NIM.7.1.**Linout** _ VME1.NIM.5.2.in

NIM Module 8: Dual gate generator

VME1.NIM.8: used for gate proton current V to F signal

VME1.NIM.8.1

Cables: VME1.NIM.8.1.**start/in** _ VME1.NIM.3.1.out
 VME1.NIM.8.1.**out** _ VME1.NIM.3.2.start/in

VME1.NIM.8.2

Cables: VME1.NIM.8.2.**out** _ VME1.NIM.2.2.inputA

NIM Module 9/10: Lujan F0 TIMING

VME1.NIM.9/10: PRT₀ lemo T with 50 ohm terminator, used for real T₀ signal.

Cables: VME1.NIM.9/10.**uAMP** _ VME1.NIM.1.3.input.4
 VME1.NIM.9/10.**T0FF** _ BNC cables to chopper
 VME1.NIM.9/10.**LFYC** _ BNC cables to chopper

NIM Module 11 and 12: used for fake T₀ signal

VME1.NIM.11:

VME1.NIM.11.2

Cables: VME1.NIM.11.2.**TTL** _ VME1.NIM.1.3.input.2 (for fake T₀)

VME crate: **VME2.VME**

1	2	3	4	5	6	empty
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VME Module 1: VMI VME 7698

VME2.VME.1: single board computer, fiber optic Ethernet to hazel

VME Module 2: VMI VME 7452

VME2.VME.2: floppy and hard disk module for single board computer

VME Module 3: Joerger scaler (counts T_0 's and proton current signal)

VME2.VME.3

Cables:

- VME1.VME.3.arm in _ VME1.NIM.1.4.out.2
- VME1.VME.3.ch1 _ VME1.NIM.3.1.out (ungated delay T_0 's)
- VME1.VME.3.ch2 _ VME1.NIM.3.2.out (gated delay T_0 's)
- VME1.VME.3.ch3 _ VME1.NIM.2.2.out (counting gated V to F proton signal)

VME Module 4: Acromag digital I/O (pins counting is from the top, pins 1 is top pair)

VME2.VME.4:

Cables:

- VME1.VME.4.p4pins2 _ VME1.NIM.1.4.in2 (goes to scaler arm in)
- VME1.VME.4.p4pins14 _ VME1.NIM.1.4.in1 (run enable signal)

VME Module 5 and 6: LeCroy CIADC units